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**Critical Resources:
Access and Competition**

Commander
T. O. Munson
U.S. Navy

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**Critical Resources:
Access and Competition**

Executive Summary

This paper presents: our interests and objectives, followed by a working definition of strategic and critical material, a brief description of the National Defense Stockpile -- what it contains, how requirements for it are developed, and how it is managed. The paper also discusses transnational trends that could limit U.S. access to or result in competition for strategic or critical materials, and provides the reader with policy options and recommendations for the future. In the interest of limiting the scope of the paper, the focus is limited to strategic and critical materials excluding strategic and critical fuels and water. Policy options and recommendations presented focus on measures short of force; however, the political alternative of last resort for solving disputes over access to or competition for resources -- military action -- is briefly discussed.

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Critical Resources: Access and Competition

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STRATEGIC AND CRITICAL MATERIALS: ACCESS AND COMPETITION

"The first, the supreme, the most far-reaching act of judgment that a statesman and commander have to make is to establish . . . the kind of war on which they are embarking; . . . this is the first of all strategic questions and the most comprehensive."

Carl Von Clausewitz

"Know the enemy and know yourself; in a hundred battles, you will never be defeated. When you are ignorant of the enemy but know yourself, your chances of winning or losing are equal. If ignorant both of the enemy and or yourself, you are sure to be defeated in every battle."

Sun Tzu

Introduction

If I had to describe the world situation for a fortune cookie, I would say it is less stable and less predictable militarily, and more economically oriented worldwide. The two quotes above point out the importance of knowing what situation one is facing and properly assessing the capabilities and intentions of the competition. To enter the post Cold War era without following the advice of Clausewitz and Sun Tzu is both arrogant and ignorant.

The end of the Cold War brought with it:

1. the collapse of communism,
2. the dissolution of the Soviet Union and the Warsaw Pact
3. the perceived end of the Russian Empire.

Unquestionably, the outcome of the Cold War left the United States in a unique position. The United States is undeniably the sole

remaining military superpower. However, allies and adversaries pose significant challenges to the United States as the world moves closer and closer to economic globalization.

As the U.S. embarks on the post Cold War era, competition for strategic and critical resources amongst all nations will increase, particularly as the world's economies continue to globalize. Competition for and access to strategic and critical resources will be keen -- made even sharper by our concern for the environment and our own economic slowdown. How then must we deal with the situation?

This paper presents: our interests and objectives, followed by a working definition of strategic and critical material, options, and recommendations. I will discuss transnational trends that could limit access to or result in competition for strategic or critical materials. In the interest of limiting the scope of the paper, I have chosen not to discuss strategic or critical fuels.

Access to or competition for resources has traditionally been somewhere at the root of many conflicts. One of the classic examples is World War II. Japan's quest for expansion necessitated increased access to resources - resources not available in the homeland. The Japanese were forced to go throughout Southeast Asia to acquire needed resources. Japanese leadership did not desire a protracted conflict with the United States. The Japanese believed Pearl Harbor would reduce American military capabilities in the Pacific to a level that would persuade the United States to stay

out of their affairs. History shows they severely miscalculated what the U. S. response would be.

U. S. policy options must address three basic aspects of resource access:

1. U.S. access in peace or war,
2. Allied and friendly nation access and how it affects the international market system and coalition capability in peace or war,
3. Access for all nations and how it affects stability and the likelihood of conflict.

During both war and peace, national security in the case of a superpower such as the United States is in part dependent on a capable military establishment and high technology industries. These in turn depend on supplies of strategic and critical materials that may or may not be the same as those required by the civilian economy. Historically, national security needs in this divergent environment have been addressed by government policies.

During its history as a nation, the U.S. policy has been inconsistent in considering what might happen if the country were to become reliant upon foreign sources for strategic and critical material. In fact it wasn't until the eve of WWII that the nation did anything serious about establishing a stockpile. Only after the Munich Conference in 1938, at the urging of people like Bernard Baruch and K. Leith, did President Roosevelt withdraw his opposition to stockpiling (Kessel, 1990).

Prior to the development of steel, America had an abundant supply of trees and cast iron to build and outfit ships, and it had what it needed to provide a strong defense. As steel making

technology emerged, nations which developed a viable steel industry had the ability to use steel to significantly improve military capabilities. However, steel production requires manganese ore -- something the United States did not possess in large quantities. The U. S. Senate held hearings to determine the impact of this and other vulnerabilities brought on by new technology. One of the recommendations was to establish a stockpile of manganese ore. Nothing was done. America entered WWI totally unprepared for industrial mobilization (Kessel, 1990). The U.S. contribution to the war effort was largely manpower; we relied on foreign equipment to a great extent. We cannot afford policies such as this in today's complex and rapidly changing international environment (Kessel, 1990).

We must be prepared to deal effectively with:

1. Cartels, e.g. OPEC
2. Private corporations
3. International terrorism and/or sabotage
4. An adversary denying access to an allied nation.

When an adversary denies an allied or friendly nation access to a particular item two things occur:

1. The allies must consider what course of action -- force or measures short of military force -- they will utilize to regain their access to the resource,
2. The finite quantity of the resource available to the allies must now be divided amongst a larger number of end users which may have an adverse impact on the ability of the coalition to fight if the dispute is to be settled by other than peaceful means.

Finally, when one examines limited access or competition for strategic and critical materials, it is easy to ascertain that when all nations have fair access to materials via the free market,

stability is positively affected and the likelihood of conflict is reduced. Conversely, when a nation's access to a resource is limited that nation may choose to respond with force directed at the nation limiting its access to the given resource. The force may take the form of direct military action, covert terrorism or sabotage, or a regional hegemon promoting regional instability through market disruption or military action.

OUR INTERESTS AND OBJECTIVES

The interests and objectives presented below are taken from the National Security Strategy of the United States. It is useful to examine the specific interests and objectives that are in some way related to strategic and critical materials, as well as those interests and objectives that are our most basic interests and may collide with the complexities of the real world. Our most basic interest is:

INTEREST:

"The United States must ensure its security as a free and independent nation, and the protection of its fundamental values intact and its institutions and people secure."

If the United States is to achieve its most basic interest -- its survival as a free and independent nation -- U. S. access to strategic and critical materials during peace or war is essential. When U. S. access is denied and our survival is threatened, we should not hesitate to consider military action. However, to avoid being forced to military action, it is important to have other options.

Our concern for global and regional security as well as the importance we place on the free market system is apparent in the following interests and objectives.

INTEREST:

"Global and regional stability which encourages peaceful change and progress."

OBJECTIVE:

"Prevent the transfer of military critical technologies and resources to hostile countries or groups."

INTEREST:

"An open international trading and economic system which benefits all participants."

OBJECTIVE:

"Ensure access to foreign markets, energy, mineral resources, the oceans and space."

OBJECTIVE:

"Promote a strong, prosperous and competitive U.S. economy."

OBJECTIVE:

"Promote an open and expanding international economic system, based on market principles."

The interests presented above, and their associated objectives, should be expected to drive our policy formulation with regard to strategic and critical materials. That is not to say there are no other interests or objectives that will influence our policy formulation. One such interest which has had a significant impact in the past, remains important for the future, and clearly demonstrates how interests can collide in the complexities of real world situations is:

INTEREST:

"Open, democratic and representative political systems worldwide."

Because of our human rights policy, we restrict our trade with several nations in Africa that are major suppliers of items we consider strategic and critical.

STRATEGIC and CRITICAL -- a definition

At this point, it is important to define what one means when one uses the term strategic or critical. What makes us think of an item as strategic or critical? For that matter, what is the difference between the two terms?

The first attempt to define strategic minerals was made by the Army and Navy Munitions Board following World War I. Two classifications were identified -- strategic materials and critical materials. Strategic materials were distinguished by their essentiality to the national defense, their high degree of import-reliance in wartime, and the need for strict conservation and distribution control. Critical materials were considered less essential and more available domestically, requiring some degree of conservation. In 1944, the distinction between strategic and critical was abandoned and the definition was simplified to "being essential for war" and requiring "prior provisioning" or stockpiling. (Kessel 1990)

The current U.S. definition, according to the Strategic and Critical Materials Stock-Piling Act of 1979, as amended, defines strategic and critical material as those that:

- a. " would be needed to supply the military, industrial and essential civilian needs of the United States during a national emergency"

b. "are not found or produced in the United States in sufficient quantities to meet such a need." (Kessel 1990)

By examining what the Army and Navy Munitions Board used as a definition, and what I have quoted from the Strategic and Critical Materials Stock-Piling Act of 1979, as amended, we find that the two definitions don't differ greatly. The first part of the definition implies essentiality; the second part refers to U.S. import reliance.

Therefore, to be considered strategic or critical a resource must possess three attributes regarding both essentiality and import dependence:

1. No substitutes. There is no ready substitute for the resource in question. This may be because no other substance can be used in certain applications or because substitutes are uneconomical. As an example, certain processes used in catalytic chemistry require platinum group metals. Since no other substances provide the same catalytic effect, there is no substitute in these applications for the platinum group metals. By contrast, silver is a ready and technically preferable substitute for copper wire used to carry an electric current. In fact, during WWII, the Manhattan Project overcame a copper shortage by using some 200 tons of silver from the U.S. Treasury stores to fabricate wiring.

2. Criticality. The lack of substitutes is not the only criterion for a strategic and critical resource. The resource also must be essential to a vital commercial or defense activity.

Ferrosilicon, as an example, is essential to the manufacture of the steels used in the hulls of naval vessels; antimony is required for the manufacture of munitions, semi-conductors, and cathode ray screens that are used for computers, sonars, and radars; and chromium is essential to the production of certain types of high-grade specialty steels.

3. Lack of secure suppliers. Political instability, as in Iran, Chile, or South Africa; or the hostility to U.S. national interests, as from Iraq or Libya make supplies from those countries unreliable. Supplies can also be jeopardized by an outside threat to an otherwise reliable supplier, such as the threat Iraq posed to Saudi Arabia and Kuwait. Another source of insecurity can be a long or hazardous transportation route. Shipments of cobalt from Zaire and Zambia, for example must travel by rail to ports in South Africa and then by ship around the Cape of Good Hope. The cobalt thus faces possible disruption from political developments in South Africa and possible interdiction by sea. What is the distinction between the two terms -- strategic and critical:

strategic refers to import dependence,
critical refers to essentiality.

Logically, one can see that an item may be classified as both strategic and critical. The above definition is both appropriate and enduring. It has served the U.S. well for years, and should continue to do so. The real problem is deciding what items should be classified strategic and critical.

There are two other terms that should be defined at this point -- dependency and vulnerability. Kenneth Kessel in his book STRATEGIC MINERALS: U. S. Alternatives provides an excellent distinction between the two terms when he says:

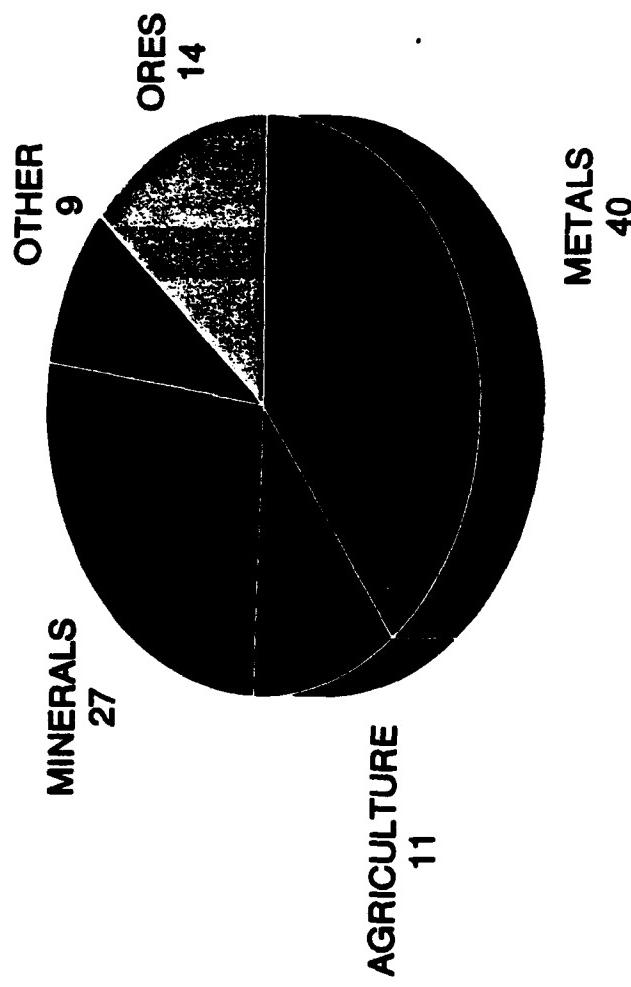
1. dependency implies domestic insufficiency,
2. vulnerability refers to an openness to attack or damage implying a condition of weakness.

Import dependence and vulnerability generally are discussed within the framework of what are called strategic and critical materials. For instance, import dependence is not necessarily accompanied by import vulnerability. The United States depends heavily on Canada for a number of important minerals, but Canada is such a reliable supplier that no real vulnerability exists.

WHAT IS THE STOCKPILE AND WHAT DOES IT CONTAIN?

The Strategic and Critical Materials Stock Piling Act (50 U.S.C. 98 et seq.) as amended by the National Defense Authorization Act for Fiscal Years 1992 and 1993 (P.L. 102-190) clearly delineates, at least conceptually, what purpose the stockpile serves. The Act requires the executive branch to determine the contents of the stockpile. Requirements are determined by the Defense Logistics Agency's Defense National Stockpile Center (DNSC). The most current figures available indicate the stockpile inventory consists of 91 commodities valued at \$9.2 billion dollars. There are five basic commodity types and the charts on the next two pages graphically represent

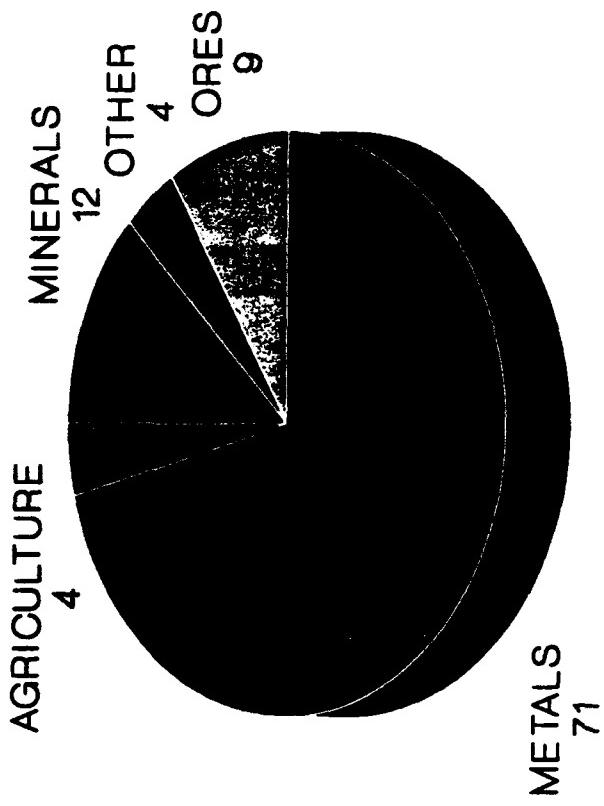
STOCKPILE INVENTORY
91 COMMODITIES @ \$9.2 BILLION
Commodity Types



VALUES ARE % OF TYPE

AS OF 30 SEP 91

STOCKPILE INVENTORY
91 COMMODITIES • \$9.2 BILLION
Market Value



VALUES ARE % OF \$9.2 BILLION

AS OF 30 SEP 91

the breakdown of the stockpile by commodity type and dollar value (Department of Defense, 1992). Examples of each type are:

- a. Agriculture -- Rubber and Tannin
- b. Metals -- Beryllium and Germanium
- c. Minerals -- Columbium and Tungsten
- d. Ores -- Bauxite and Chromite
- e. Other -- Jewel Bearings and Diamonds

Each item meets the definition for strategic and critical. The DNSC provides the actual inventory and financial status of the stockpile to Congress annually in the STRATEGIC AND CRITICAL MATERIALS REPORT TO THE CONGRESS.

HOW IS THE STOCKPILE MANAGED?

President Reagan, in February 1988, transferred the function for the administration of the Stockpile, from the General Services Administration (GSA) to the Secretary of Defense effective 1 July 1988. The Secretary of Defense charged the Director, Defense Logistics Agency, with management of the Stockpile. Planning, market research, quality assurance, technical services, contracting and disposal are accomplished at the Stockpile national headquarters in Arlington, Va. Actual stock piling operations are conducted from the three zone offices located in New York, Indiana, and Texas.

Under the arrangement established by President Reagan and as required by section 14 of the Stock Piling Act, the Secretary of Defense submits a biennial report to the Congress. This report must include:

1. the Secretary's recommendations for stockpile requirements

2. national emergency planning assumptions used in determining the stockpile requirements recommended by the Secretary, based upon total mobilization of the economy of the United States for a period of not less than three years for a sustained conventional global war of indefinite duration.

The President submits with each biennial report a statement of his plans for meeting the recommendations the Secretary of Defense set forth in the report (Department of Defense, 1992).

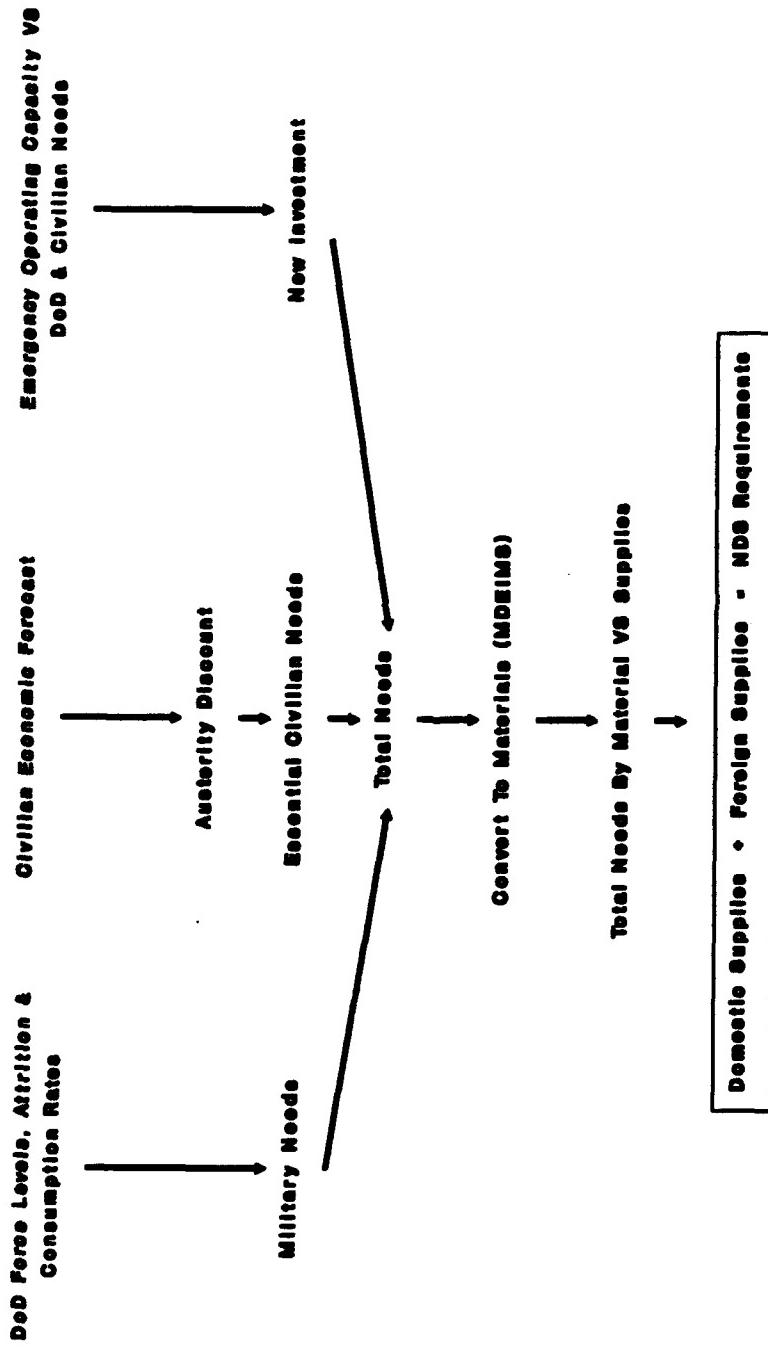
STOCKPILE REQUIREMENTS DEVELOPMENT

Principal among the assumptions and factors used to develop the requirements are the:

1. DoD force levels, attrition and consumption rates,
2. Civilian economic forecast,
3. Emergency operating capacity vs DoD and Civilian needs.

The Department of Defense, in particular the Joint Staff determines military requirements for equipment and material in the statutorily mandated scenario based on force structure and projected consumption and attrition rates relevant to the war scenario. The Council of Economic Advisors provides the stockpile manager with item two, the civilian economic forecast. The forecast of the civilian economy is necessary to determine how much existing industrial capacity is available for production of defense goods. The Bureau of Mines provides the Stockpile manager with item three, the comparison between the emergency operating capacity and the DoD and civilian needs. The diagram on the following page graphically illustrates how the requirements come together as "Total Needs." "Total Needs" are expressed as a dollar figure. The next step is to convert the

REQUIREMENTS DEVELOPMENT



"Total Needs" expressed in dollars to materials, using an econometric model called MDEIMS. The next step is to compare the "Total Needs" by material to the supplies onhand, and the final step in this very simplified analysis of the requirements determination process is represented in the bottom box on the diagram. Once the National Defense Stockpile requirements are known, all that remains is to determine what is required from foreign suppliers and what can be provided by domestic suppliers. When foreign suppliers are considered as sources of materials, planners must account for:

1. war damage to supplier countries,
2. estimated U.S. share of foreign production,
3. estimated shipping losses.

Completion of the requirements process naturally leads to the Annual Materials Plan (AMP) process. During the development of the AMP, DNSC accounts for: the Stock Piling Act, JCS requirements, essential civilian needs, OSD policy, and Interagency Market Impact Committee considerations. The DNSC forwards the proposed AMP through OSD and OMB to Congress for approval. Once the Congress approves the AMP, funding may be provided for acquisition of materials.

WHO IS THE COMPETITION?

Competition for strategic or critical materials may come from allies and adversaries alike. We must be prepared for the reality of competition or limited access to those items we consider strategic or critical. Obviously, it is in our best

interest to have some idea of who the competitors will be, and how they might attempt to limit U.S. access to needed materials. Access limitation will most likely be the result of a potential adversary's foreign policy. Proper employment of the intelligence element of national power will be key to correctly estimating the competitor's capability and intent.

Stockpiling critical materials has been practiced by the United States, since the late 1930's, to ensure a minimal supply in the event of war, with the marketplace being relied upon as the primary means of correcting temporary shortages and price fluctuations. However, increasing U. S. dependence on materials imports, together with increasing competition for materials among other nations, pose new dangers to the supply required by a healthy economy -- dangers which neither the strategic stockpile nor the normal operations of the marketplace have completely averted or counteracted. On a national level each country has a different raw materials demand and supply framework. Non-fuel minerals -- the so called basic materials such as steel, copper, aluminum, nickel, lead, zinc, and tin -- are universally consumed in varying quantities by all countries.

There are very basic differences between raw materials policies of the centrally planned economies and the free market industrialized economies. In the former, raw materials supplies are allocated according to centrally planned objectives for specific industries and the military establishment.

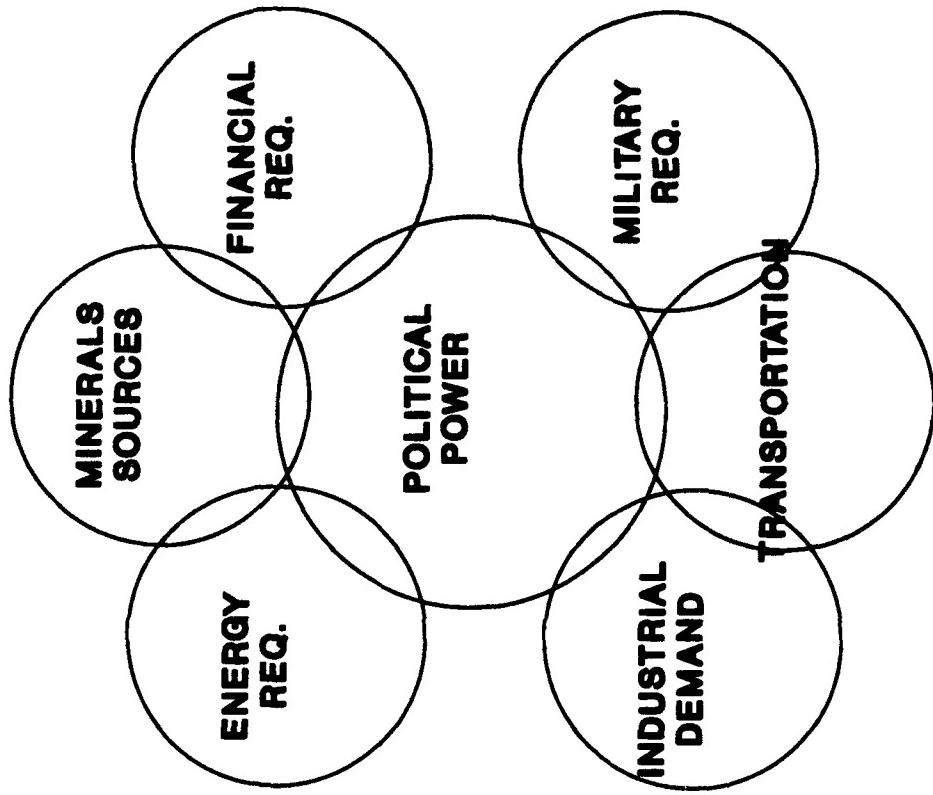
By contrast, free market economies like the United States have developed in a competitive environment of abundant natural and capital resources. Under those conditions, and in the absence of incentives or regulations, industrial end-users and raw materials suppliers can be expected to follow their own independent objectives with regard to raw materials supply and consumption. However as access to some strategic or critical resources becomes less certain, and as national economies become more globalized and corporations become less nationalistic, the problem of assuring national security needs are met becomes more complex.

Several factors influence the supply and consumption of various raw materials in any country. I have shown these graphically in the figure on the following page. These factors include:

1. Minerals sources, or the existence of mineral deposits,
2. Energy requirements, existence of sufficient energy supply,
3. Financial requirements, the availability of capital and technology,
4. Transportation infrastructure,
5. Industrial demand,
6. Military demand,
7. Political power (Szuprowicz, 1981).

Political power is probably the most important factor influencing raw materials supply and demand in most countries, although it may not appear to be so at first glance. Political

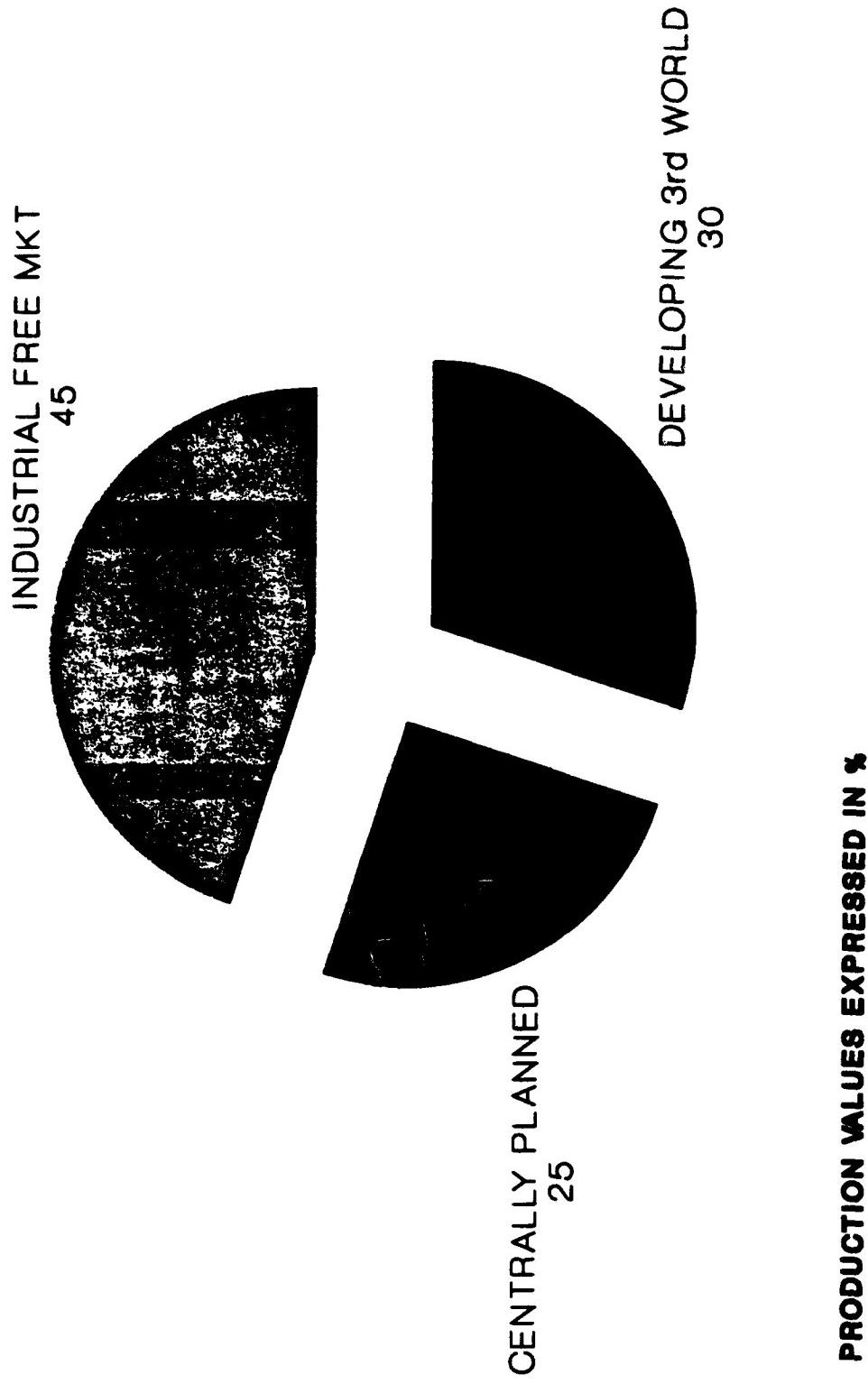
MAJOR FACTORS INFLUENCING RAW MATERIAL SUPPLIES



power controls such other factors as exploratory rights, labor costs and availability, environmental restrictions, capital investment, energy supplies, rights of way, taxation, import and export duties, foreign trade organizations, and industrial development (Szuprowicz, 1981). The degree of dependence and interaction between these various factors influencing the supplies of raw materials vary, depending on the type of political control in a particular country.

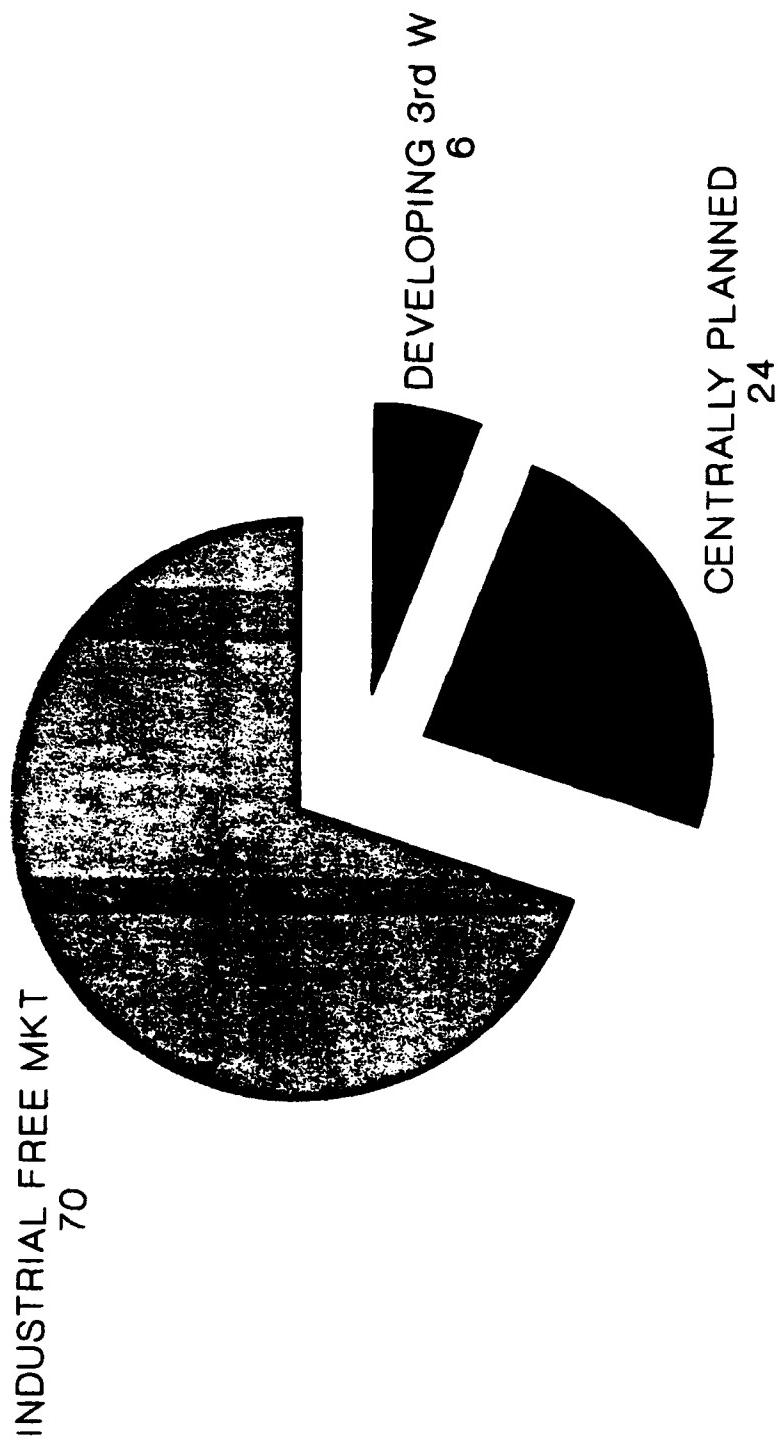
For example, in the centrally planned economies interaction and control are extreme, and political power dominates all other factors. In the third world, economics driven by political power, plays a greater role than in the free market economies. In many instances mining and production of raw materials is a major industry in those countries that lack the diversity of industrialized economies. Exports of raw materials provide foreign exchange that is required to pay for imports of equipment and technology to keep the economy in operation and maintain political power. In free market industrialized economies, particularly the United States, most factors come into play somewhat independently, and numerous alternatives may exist at any one time leading to various conflicts of interest and greater foreign dependence. The pie charts on the next two pages graphically depict the world, prior to the disintegration of the former Soviet Union, with regard to strategic and critical material usage and production.

THREE BASIC NATIONAL ECONOMIES MINERAL PRODUCTION



THREE BASIC NATIONAL ECONOMIES

MINERAL USAGE



USAGE EXPRESSED IN %

WHAT ARE SOME OF THE TRENDS

Certainly it is valid to examine some of the transnational trends that may impact U. S. access or competition for strategic and critical resources. I would delineate the trends as follows:

1. Limited suppliers / producers -- as the world supply of minerals tends to diminish, the number of suppliers and producers of any given commodity may also diminish. It is reasonable to assume that as the supply and suppliers decrease, competition for that resource and the price will increase. During a personal interview on 12 March 1992 the former director of the National Defense Stockpile, Mr. Wayne J. Kulig indicated that high carbon ferroalloys, particularly ferromanganese, is an example of this assertion. According to Mr. Kulig there is only one processing plant for ferromanganese in the United States. The world supply of the alloy is diminishing and according to Kenneth Kessel 31.4% of the world production capability is in the former Soviet Union.

2. Advancing Technology -- rapidly advancing technology may bring with it the development of new and more efficient substitutes, and that is good. However, in a global economy, that substitute development may well take place in a foreign country. Continued use of the cheaper more efficient substitute removes the incentive of the supplier / producer by providing him with a shrinking market.

3. Environmental concern -- as global concern for the environment grows, the world is faced with an ever increasing price tag for: cleanup, and "clean" processes. Nations will reflect this concern for the environment by:

- a. an unwillingness to further damage the environment thus limiting mining / production and / or,
- b. an increase in the price of the resource to end-users.

Steel, although not by itself a strategic or critical material is an appropriate example. U.S. concern for environmental damage caused by steel production resulted in severe legislation aimed at cleaning up the industry. Those producers who could not afford the fines or the cost of updating facilities to comply with the law went out of business or moved abroad. Even the new mini-mills which can compete financially with foreign producers must meet environmental requirements which are expensive. The added cost is ultimately reflected in the cost of the end product.

4. Capital cost / availability -- both suppliers / producers and end-users of strategic and critical materials

are affected by capital costs and availability. The U. S. economic situation makes it particularly vulnerable. We cannot afford an item at any cost. But, we cannot afford to relinquish world leadership because of a shortage of any particular strategic or critical item.

5. Recycling potential -- for example, a considerable amount of gold is used in the electronics industry. Recovery of the gold and other precious metals from electronics scrap is relatively simple -- accomplished by electrolysis. What is not trivial is the collection and transportation of electronics scrap. The costs of these elements in the process make the process too expensive and time consuming to consider (Szuprowicz 1981).

6. Regional instability -- as traditional Cold War political and economic alignments are reshaped in the absence of superpower competition, regional hegemons can be expected to emerge. In some cases their interests will be inconsistent with those of the industrialized nations; and they may attempt to achieve their objectives through regional instability.

POLICY OPTIONS

Three categories can describe U. S. policy alternatives for solutions to shortages of strategic and critical material -- technical, economic, and political (Szuprowicz, 1981). The next page provides a breakdown of the types of alternatives and the elements of the alternatives. I have included research and development, exploration, undersea resources, remote region resources, and space resources as economic alternative elements because of the profound positive impact work in those areas may have on our troubled economy. Today and in the future the success of our industrial base and the relative strength of our industrial power is dependent on having a healthy and strong

economy. I see those areas as rich, untapped frontiers capable of yielding great benefits to our economy if we invest in them.

ALTERNATIVE TYPE:

Technical

ALTERNATIVE ELEMENTS:

Substitution
Recycling
Product redesign
Innovation
Technology transfer

Economic

Lower grade reserves
Research & development
Exploration
Materials management
Stockpiling
Trade Agreements
Contract renegotiation
Undersea resources
Remote region resources
Space resources

Political

Tax incentives
Government subsidies
Risk insurance
Investment policies
Conservation programs
Environmental restrictions
Foreign aid programs
Common Markets
Import / Export guarantees
Tariff reductions
Security treaties
Military action

The private sector, when sufficiently motivated by profit, will adequately pursue the items I have listed as technical alternative elements. In point of fact, most of the areas listed as technical alternative elements enjoy an abundance of private sector involvement. Additionally, the political alternative of last resort for solving disputes over access or competition to resources is military action.

I have listed 12 alternative elements as political alternative solutions to shortages of strategic and critical materials. There is certainly nothing magical about the categories I have listed. In fact, one could easily argue conservation programs is a technical alternative with substitution, recycling, product redesign and innovation as subsets of conservation. If materials substitution and diversification of supplies are two of the most desirable alternatives to maintaining a stockpile for strategic and critical materials let's explore the possibility of diversification. How does a country develop a diversified supply of strategic and critical materials? I would suggest that there are several political elements -- tax incentives, risk insurance, investment policies, and foreign aid -- that may contain the answer.

POLICY OPTION 1

ECONOMIC STOCKPILING

Description

Economic Stockpiling is the accumulation and storage of materials for the express intention of being able to affect their distribution to accomplish public purposes other than the wartime emergency conditions stipulated in the strategic stockpile. It is paying the acquisition and holding costs in anticipation of reducing the costs of possible future problems. A decision to establish an economic stockpile depends on the belief that there

will be an eventual net benefit either through deterrence of a problem or through relief if a problem occurs.

There are five reasons which require the United States to at least consider economic stockpiling:

1. Increasing U.S. dependence on imports materials
2. International cartel actions
3. Response of the U.S. market system to materials problems
4. Use of U.S. stockpiles for economic purposes, and
5. Economic stockpiling in certain other foreign countries.

The same threats of supply disruptions which could seriously impact the United States could also threaten the economies of the other nations, many of which are our allies and are more import dependent than the United States. Several such countries have established economic stockpiles as a form of self protection against supply disruptions or price increases. One can see that it is extremely important for the United States to pay close attention to the materials which these countries may stockpile.

Inherently, economic stockpiling is a process of market intervention and will create economic as well as political impacts. As an example, let us consider two allies, X and Y, with greater dependence on foreign imports than the United States. Let's say that country X maintains both a government owned stockpile and grants incentives to private industry to insure price stability of a particular item. Let's say that Y is a major importer and heavily reliant on X as a source of supply for this particular item. If X decided to cut back on its

exportation of the item for either economic or strategic reasons, Y and the other importing nations would be adversely affected, potentially creating foreign policy implications for the United States -- do we consider going to war because an allied or friendly nations' access to a resource is curtailed? Countries currently involved in economic stockpiling are Japan, France, Sweden, European Common Market, United Kingdom.

Although the original concept of a strategic materials stockpile was designed to provide the necessary inputs to the military - industrial complex to give it the capability to conduct a prolonged conventional war, it is now being extended to the operation of international minerals markets through buffer stocks, commodity agreements and trade controls.

Materials substitution and diversification of supplies are two of the most desirable alternatives to maintaining a stockpile for strategic and critical materials. However, government and industry still look toward stockpiling as another method not only to assure critical materials availability but to provide a domestic deterrent against excessive price manipulation by foreign supplier countries.

Pros

Possible positive functions of an economic Stockpile:

1. provide source of supply for short term national shortages,
2. deter monopolistic control of supply,
3. stabilize supply/demand through buffer stock,

4. provide support to price support programs e.g. maintain a warm production capability (U.S. Congress Office of Technology Assessment 1976).

Cons

There are disadvantages in establishing and maintaining large stockpiles. The major disadvantage of materials stockpile is the cost of its establishment, maintenance, and related transportation requirements. Stockpiles are essentially investments that bear no interest, even though the value of the material may appreciate. There is a very real possibility that loss of interest on capital tied up in advance purchases may turn out to be greater than the average increase in the price of materials being stockpiled in a fluctuating market, particularly when the cost of storage, maintenance and transportation is considered (Szuprowicz, 1981).

Because stockpiling is basically market intervention, it is legitimate for one to ask:

1. Under what conditions and to what extent is it justifiable for the federal government to intervene?
2. Should such intervention be used to require private industry to disclose confidential proprietary information to stockpile managers?
3. If so what safeguards will be taken to protect the privacy of such information?

Until such time as satisfactory answers to the questions exist, the questions must remain on the "con" side of the argument.

POLICY OPTION 2

FISCAL POLICY -- A PRIVATE INDUSTRY MOTIVATOR

Description

Diversification of supply means increasing the amount of a particular item on the free market by:

1. increasing the number of suppliers or
2. by improving the productivity of existing suppliers.

Tax incentives and favorable investment policies are two "political tools" that can encourage private investors industry to invest in overseas operations. Additionally, risk insurance is a form of protection afforded to the investor by the Overseas Private Investment Corporation, OPIC. Risk insurance does just as its name implies, it insures the investor against such things as nationalization of his assets etc. Let's use as an example Chromium which is used among other thing in the production of stainless steel. The United States imports most of its chromium from the Republic of South Africa and Zimbabwe. Currently the stockpile is deficient in chromium and relations with the Republic of South Africa and Zimbabwe are not delightful because their policy and ours, with regard to human rights, differs. The former Soviet Union also has a large supply of chromium. It certainly is no secret that the CIS is in need of hard currency and investment capital to facilitate economic growth. Provided with motivation from favorable tax incentives and investment policies and risk insurance, private entrepreneurs may choose to

form a business in the CIS to produce chromium for the market place.

Pros

The above scenario is not terribly far fetched and its advantages are:

1. U.S. access to chromium improves because our supply is diversified by having more suppliers and a larger base from which to purchase chromium
2. western companies, favorable to democratic government and the United States are started in a new democracy
3. both countries benefit by having increased number of trading partners
4. as the two countries become increasingly entangled through economic growth and trade it will become less likely that an unsympathetic government, should one come to power, would sever trade with the United States.
5. The real cost of the development is paid by private investors rather than by taxpayer dollars from government coffers.

Cons

The new trading partner in the CIS could become discouraged if the development is not sustainable -- environmentally, economically, and institutionally. In the worst case scenario the new democracy could become so discouraged that democracy and capitalism could be abandoned for a return to communism.

POLICY OPTION 3

FOREIGN AID

Description

Foreign aid is a political tool that can be applied directly by the U.S. government to improve the infrastructure in a foreign

country and thereby improve that country's productivity. Examples where this method has been utilized and the countries became alternate sources of strategic and critical materials are: Zaire, Zimbabwe, Thailand, and Jamaica. In Zaire and Zimbabwe the U.S. government invested significant amounts of money into the waterways. Transportation of the Chromium and U.S access to chromium improved for a time. It is unfortunate that relations between the United States and Zimbabwe have taken a turn for the worse. The United States depends upon Thailand as one source for Columbium, Tantalum, and Tin. The United States depends upon Jamaica for Bauxite and Alumina. Both Thailand and Jamaica have been success stories. Significant amounts of aid have been invested in both countries' infrastructures; and both countries are willing providers of the materials on the free market. As it happens the U.S. stockpile is still deficient in Columbium, Tantalum Bauxite and Alumina. Stocked quantities of Tin on the other hand exceed requirements.

Pros

The link between the governments is more direct and the U.S. can exert more pressure to improve those areas of infrastructure it sees as best able to suit its vital interest of improved access to a specific material. As the developing country gains comparative advantage in the market place, U.S. cost for the material should decrease. If the infrastructure growth is sustainable, it may foster growth in other industries making the

countries more valuable trading partners, and generally increasing access of the resource to all countries.

Cons

The financial burden is ultimately born by the taxpayer of the United States. In times when our economy is stressed, the U.S. cannot afford to invest in uncertain situations. A poor investment in a government that becomes unstable could be politically embarrassing and economically devastating for all concerned. In the past there have been many more failures than successes in foreign aid programs, especially those administered by the Agency for International Development (AID).

To be successful, foreign aid must be free of congressional meddling, must be aimed specifically at those projects that are productivity enhancing infrastructure improvements, and must have as an ultimate goal the elimination of foreign aid to the receiving country.

POLICY OPTION 4

"THE STATUS QUO"

Description

There is always the option to continue doing business in the way we have in the past. We have maintained a stockpile worth approximately \$9.2 billion dollars for the express purpose of serving the interest of national defense only.

Pros

The stockpile as it is currently configured partially meets our projected needs. The annual operating cost of \$33.0 million dollars represents only a small fraction of the acquisition cost of putting a stockpile together. It is doubtful that we could afford to build a stockpile the size of the one we now possess. The cost \$33.0 million is broken down roughly as follows:

\$5.0 million for care of material in storage,
\$5.0 million for preparation of the inventory for sale,
\$23.0 million for salaries, rent, facility repair and other overhead.

Cons

While the \$33.0 million annual operating budget for the stockpile is only a small fraction of the stockpiles replacement value, \$33.0 million is still a sizeable piece of change. Our current sales policy has not reinvested the money into either financial investments to be held for future stockpile acquisitions or research and development for study of advanced materials etc. The stockpile, through sales, is being depleted and the proceeds of the sales are going to other programs.

RECOMMENDATIONS

Let me preface my recommendations by saying that no person loathes war -- armed conflict -- more than those who have chosen the profession of arms for their livelihood. For they have had to dance closely with this maiden of death and destruction and

have found her void of all glory and romance. One final quote from Sun Tzu may help the reader frame the recommendations.

"What is valued in war is victory, not prolonged operations. Those skilled in war subdue the enemy's army without battle. To subdue the enemy without fighting is the supreme excellence."

1. Develop and implement an industrial policy that clarifies and cements the relationships between: the DNSC, the emerging and critical technologies, and the advanced materials industries. The policy must ensure that: advanced materials requirements are known and supported, critical technologies processes are not disclosed without proper authority and the Stockpile manager knows what is required to support both the critical technologies and the advanced materials industries.
2. Amend the current statutes to allow the stockpile to function as an economic stockpile; and change the provisions limiting the sale of excess material. There may be circumstances when excess material sales should be permitted without regard to the domestic and international market disruptions such sales might create. Limitations on excess sales can place unnecessary restrictions that usurp the stockpile manager's ability to make spot buys of another needed commodity when the price is particularly attractive. Additionally, sale of excess material could be a powerful political tool for the President to utilize as a measure short of force.

3. Provide private industry with meaningful tax and investment incentives to encourage the development of a widely diversified supply of strategic and critical materials. Private industry, when motivated by profit, could provide sustainable development in new areas, both increasing the number of suppliers and the quantity of material on the free market. Development of oceanic resources is also possible but requires tax and investment incentives to offset the tremendous cost.

4. With economic assets and funds limited, we need to rethink our foreign aid programs. We should restructure our foreign aid program such that we maximize our return on investment. This may mean that we reduce the amount of aid that is provided to certain countries in the Middle East for defense and provide money to developing countries elsewhere. In so doing the amount of money we spend on foreign aid may not increase or decrease but we may be able to significantly impact a developing country's economy, productivity, and ability to trade resources for U.S. products.

5. We should pursue a more open policy of technology transfer with allied and friendly nations in the interest of conservation and substitution of resources. For example, one of our allies may be on the leading edge of composite development that would reduce U.S. dependence on exotic metals.

Military force is the least desirable option for obtaining strategic and critical resources. As an example, there is little doubt about U.S. ability to regain possession of the Nickel mine

that the United States legally owns in Cuba. The United States purchased the mine in the 1950's before Castro came to power. If we were to invade Cuba what then? The military is not equipped or trained to conduct mining operations. Once mined, the military could at best, escort and protect the ore while in transit to the port.

In conclusion, Morgenthau, in his book Politics Among Nations, indicates that it is the proper balance of the elements of national power that will allow a country to pursue a given foreign policy with maximum chance of success. Perhaps by following the recommendations above, the United States can ensure peaceful access to resources for all, and at the same time control its economic recovery, and pursue a foreign policy that promotes democracy, free trade and sustainable global economic expansion.

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